ALTERNATIVE LANDFILL COVER DEMONSTRATION

TECHNOLOGY DESCRIPTION

The Alternative Landfill Cover Demonstration (ALCD) is testing innovative landfill covers using currently accepted U.S. Environmental Protection Agency (EPA) cover designs as baselines. These covers are installed and instrumented in a side-by-side demonstration. The covers built include two baseline covers: (1) a conventional Resource Conservation and Recovery Act (RCRA) Subtitle D Soil Cover and (2) a conventional RCRA Subtitle C compacted clay cover. There are also four alternative covers utilizing, respectively, a geosynthetic clay liner, a capillary barrier, an anisotropic barrier, and a design using evapotranspiration. One half of each test plot will be evaluated under ambient conditions and the other side will be evaluated under "stressed" conditions controlled by a rain simulation system. The demonstration is intended to evaluate the various cover designs based on their respective water balance performance, ease of construction (including the use of local materials), and cost.

The key to gaining general acceptance of any new environmental technology is obtaining regulatory acceptance. The ALCD is addressing this issue by involving environmental divisions from the western states and the EPA in the project. This involvement is key for obtaining acceptance of the new technologies and is encouraging interstate cooperation. The Western Governors' Association (WGA) through its Committee to Develop On-Site Innovative Technologies (DOIT) has worked with Sandia National Laboratories (SNL) to promote interstate cooperation.

TECHNOLOGY NEED

An EPA study of contaminant migration at 163 randomly selected landfills concluded that current landfill practices need improvement. Problems were discovered at 146 of the 163 sites. Another study sponsored by the California Environmental Protection Agency (CEPA) revealed that as high as 86 percent of existing landfills are failing. All areas of the country have experienced some form of water contamination due to leachates from landfills.

Current cover design criteria emphasize barrier layers that block infiltration of water through the cover into the waste. The measurement of saturated hydraulic conductivity is the method chosen by the EPA to define the effectiveness of the barrier layer (e.g., the lower the hydraulic conductivity, the more effective the layer). This is not a practical solution in arid and semi-arid regions because saturation of cover soil layers is rarely, if ever, achieved.

The saturated hydraulic conductivity method can actually be detrimental to covers in arid and semi-arid regions. In order to achieve the low saturated hydraulic conductivity required by the EPA, the barrier soil must be remolded by compacting it “wet of optimum”; this eventually leads to the soil drying, shrinking, and cracking, leaving the barrier layer ineffective. These cracks provide pathways for the infiltration of water, which defeats the original purpose of creating a barrier layer to block the infiltration of water into the waste.

The ALCD is developing technologies to improve current landfill cover systems. The project will provide alternatives to the EPA's landfill cover designs that will work more effectively and be easier and less expensive to install in arid and semi-arid climates. It is also working to improve regulatory acceptance of alternative landfill cover designs for use across the U.S. Department of Energy (DOE) complex.

The DOE Technology Coordination Group (STCG) Need Numbers and Titles are:

- AL-09-01-09-MW – Integrated Systems Approach to the Destruction and Treatment of Both Solid and Liquid Combustible Plutonium-238
- AL-09-01-10-MW – Integrated Systems Approach to the Destruction and Treatment of Both Solid and Combustible Plutonium-239

- RL-MLW12-S – Concepts/Methods for the Prevention of Migration of Radionuclides and Hazardous Components from Buried Radioactive Wastes
- RL-SS17 – Long-Life Waste Isolation Surface Barrier
- RL-WT017 – Long-Term Testing of Surface Barrier
- RL-WT018 – Testing of Sand-Gravel Capillary Barrier
- RF-ER05 – Capping Design for Arid and Semi-Arid Climates
- RF-ER13 – Capping or Treatment (Stabilization) for the Rocky Flats Ash Pits

Aerial View of the Alternative Landfill Cover Demonstration near Albuquerque, New Mexico

TECHNOLOGY BENEFITS

- This effort should result in effective landfill cover designs that are longer lasting and less expensive for arid and semi-arid regions.
- The ALCD costs should be less expensive than current systems because this effort should result in more efficient landfill cover designs tailored to specific site requirements by a decision support system.
- The use of native soils will greatly reduce costs normally associated with clays and membranes that are required by the EPA.
- Costs for the alternative cover technologies are less than half that of current EPA RCRA Subtitle C traditional covers.

- Site operators from all over the nation have expressed interest in obtaining the demonstration results. These results can then be used by site operators to apply for permits to use alternative landfill cover technologies, which are expected to save millions and ultimately billions of dollars nationally.

TECHNOLOGY CAPABILITIES/LIMITATIONS

The ALCD will yield data that will enable the deployment of better performing, cheaper landfill covers saving the DOE billions of dollars. The covers will be longer lasting and will be easier and more reliable to build than currently used technologies. The covers tested in the ALCD are generally limited to dry environments such as that found in the Southwestern part of the United States where DOE has a large number of facilities and landfills to be closed.

COLLABORATION/TECHNOLOGY TRANSFER

The ALCD has collaborated with the EPA, environmental departments in 15 Western states, the EPA's Risk Reduction Laboratory, U.S. Forest Service, City of Albuquerque, Los Alamos National Laboratory (LANL), WGA, U.S. Department of Defense (DoD), and the U.S. Bureau of Land Management (BLM).

ACCOMPLISHMENTS AND ONGOING WORK

The test covers and associated test facilities have all been constructed for the demonstration. The automated data acquisition system is up and running and has already recorded more than three years of data. Many reports have been published which have gained a widespread national interest. The project has been presented as the featured topic at the annual American Society of Civil Engineers (ASCE) convention in San Diego and was the subject of a featured article in a Civil Engineering Magazine article.

Papers and Reports

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- Dwyer, S. F., J. C. Stormont, and C.E. Anderson (1999). Mixed Waste Landfill Design Report. Sandia National Laboratories Report SAND99-2514.

TECHNICAL TASK PLAN/TECHNOLOGY MANAGEMENT SYSTEM INFORMATION

TTP No./Title: AL28C221 - Alternative Landfill Cover Demonstration
Tech ID/Title: 10 - Alternative Landfill Cover Demonstration

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